

# Student Interaction in Learning Mathematics in Classroom

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**Abstract**—This research was a descriptive qualitative research which intended to find out the description about the interaction between students and teacher in the classroom and to find out the factors which underlay the interaction between teacher and students in the learning process at Grade XI of SMA Negeri 5 Samarinda. This research was conducted from August to October 2015. The subject of this research was the students of Grade XI of SMA Negeri Samarinda, while the object of this research was the interactions between students and teacher as well as the factors which influenced the interactions in the material of matrix, flower, growth and decay. The data were collected through observation, documentation, and interview. The data were analyzed through data reduction, data display, and conclusion drawing and the data were validated through triangulation. The observation was conducted 10 times and the students' notes as well as some activities of students and teacher during the teaching and learning process were documented. The activities included the time when the teacher explained the lesson, when the students worked with exercises in front of the class and other activities in the material of matrix, flower, growth and decay. The interview was conducted to 9 students who represented the active and the passive students during the learning process. The interview focused on the factors which underlay the interaction between teacher and students during the teaching learning process. The research finding showed that the interaction which occurred in the teaching and learning process comprised of some types such as follows: giving motivation to students; asking students to read the example of the problems on the student book; explaining the lessons, providing exercises, questions and answers between teacher and students, and group discussions. The result of interview showed that the factors which underlay the interaction between teacher and students were as follows: (1) The efforts made by the teacher to maximize the use of facilities which supported the occurrence of interaction.; (2) The students' interest in learning math; (3) Students' Intelligence; (4) The perception that the existing subjects were important; (5) The classroom condition which did not support the number of students in the classroom; and (6) The utilization of learning resources by students. Therefore, the research findings showed that there were interactions between teacher and students in the teaching and learning of mathematics. The interactions covered one-way interaction, two-way interaction and multi-way interaction. The factors which underlay the occurrence of the three types of interaction were the factors of teacher, student, instructional material and situation.

**Keywords**— student interaction, learning mathematics. descriptive qualitative.

## I. INTRODUCTION

One of the activities of human life which is inseparable from the process of interaction and communication is teaching and learning activities in the classroom. School is a formal educational institution which is expected to be a spearhead for the advancement of a nation. A nation will be developed if it has a high quality of human resources (HR). The quality of a country in the future relies on the education received by the present generation, especially through formal education provided in schools. One of the efforts to improve the quality of education is through the improvement of curriculum. The application of curriculum 2013 demands a number of basic changes in the process of teaching and learning in schools. Based on Curriculum 2013, the learning process emphasizes on the essence of scientific approach. The regulation of Minister of Education and Culture Number 81 A Year 2013 Appendix IV on General Guidelines of Learning, states that Learning Process consists of 5 fundamental learning experiences, namely observing, questioning, collecting information, reasoning and communicating.

Cockroft stated the reasons why mathematics is taught. It is because mathematics is extremely required and useful for everyday life, for sciences, trades and industries and because mathematics provides a power, short and unambiguous communication tool and it functions as a tool to describe and to predict. Mathematics reaches its power through its own symbols, grammar, syntax and it develops critical, axiomatic, logical and deductive thinking patterns. [5]

Sardiman stated that teaching and learning interaction is defined as an interaction between a teacher who is performing a task of teaching in one hand, and learning community (students, learners/learning subject) who are involving in a learning activity on the other hand. Edi S gave the details of the characteristics of teaching-learning interaction as follows:

- a. Teaching and learning interaction has a goal to help children in a certain phase of development. Therefore, teaching and learning interaction is goal-conscious, placing the students as the center of attention. Students have goals; other elements are merely introduction and supporting elements.
- b. Teaching and learning interaction is characterized by one specific instructional material. In this case the material

should be carefully designed to achieve the predetermined objectives.

- c. It is characterized by the students' activities. As the consequence that students are the center of learning, the students' activities are the absolute requirements for the teaching and learning process to take place. In this case, the students' activities include active physical and mental involvement.
- d. In the teaching and learning interaction, teachers play a role as a guide. In their role as a guide, they are required to give motivation to students in order to create conducive interaction process.
- e. In the teaching and learning interaction, discipline is required. In the teaching and learning interaction, discipline is defined as a behavioral pattern which is managed in such a way according to the norms and rules which are consciously observed by all parties, including teachers and students. The concrete mechanism of the adherence to the rules and regulations can be seen from the implementation of the procedure. Therefore, the steps which are taken should follow the planned procedure. The violation on the procedure is an indicator of the violation of discipline.
- f. There is a time limit. In order to achieve particular instructional objectives in a class system (group of students), time limit becomes one of the aspects which may not be ignored. Every goal has its own time limit that is the time when the goal has to be accomplished [3].

Sudjana stated that teaching and learning interaction can be viewed from four aspects, namely question and answer or dialog between teacher and students, the assistance of the teacher to the students who have learning difficulties, both individuals or groups, warnings from the teacher, and teacher role as a facilitator [2]. The interaction can take the forms of explanation, discussion, reflection, or approval used to solve any problem [1].

## II. RESEARCH METHOD

This research applied qualitative method which aimed to obtain information and description about the interaction between teacher and students in learning mathematics at Grade XI of SMA Negeri 5 Samarinda in the academic year 2017/2018, To obtain the required data and information, the researcher conducted classroom observation by sitting in the classroom and watching the process of the teaching and learning of mathematics at Grade XI. The data were in the form of qualitative data which consisted of notes relevant to the interaction occurring during the teaching and learning process.

Then, based on the field notes, the forms of interaction between teacher and students during the process of teaching and learning were identified. The students who actively and inactively participated in the interactions during the teaching and learning process were also identified. Furthermore, the forms of interaction that had been identified during the process of teaching and learning were

put into categories. This research was conducted from August to October of odd semester in academic year 2017/2018 located at SMA Negeri 5 Samarinda on Jalan Juanda Samarinda. The subject of this research was the students of grade XI of SMA Negeri 5 Samarinda with the total of 36 students. The object of this research was the interaction between teacher and students in the teaching and learning of mathematics at grade XI of SMA Negeri 5 Samarinda, odd semester in academic year 2017/2018. The data were collected through observation, documentation and interview. The observation was conducted during the learning process of mathematics was taking place. In this case, the researcher acted as the observer, attending the class meeting and observing the activities of teacher and students when the teaching and learning process was taking place. Based on the results of observation, the interactions between teacher and students during the teaching and learning process at Grade XI of SMA Negeri 5 Samarinda were described. The documents obtained in this research included pictures during the teaching and learning process, some teacher's notes on the whiteboard and students' notes. Some of the documents were displayed to show the existence of interactions during the learning process. Some students were interviewed. The students who were selected to be interviewed were those who were identified to have active attitudes and behaviors in the interactions and those who were identified to be inactive during the learning process. The result of the interview gave the description related to the factors which underlay the interaction between teacher and students in learning mathematics in the classroom.

The research findings were displayed in the forms of words, describing the interaction between teacher and students during the learning process. The information was supported by the images of students' notes and pictures showing the interaction between teacher and students that were taken during the learning process.

## III. RESEARCH FINDING

### A. The Implementation of Learning Mathematics at Grade XI in SMAN 5 Samarinda

The results of observation on the implementation of learning mathematics at grade XI of SMA Negeri 5 Samarinda with the topic of Matrix can be explained as follows:

1. *Preparation and Pre-Learning Activities.* The teacher opened the lesson by greeting the students and asking them if they were ready for the teaching and learning activities. In some subsequent meetings, the teachers gave learning advice and motivation to the students. One of the conversations extracts which described the pre-activity can be seen as follows: (The teacher entered the classroom, and then he sat on the teacher's chair and greeted the students)

G : "How are you today?"

SS : "Fine, Sir."

G : "Today I am the one who will teach you mathematics in this class. Before we continue, I would like to know your names. Sometimes I find it difficult to remember names"

(The teacher took the attendance and called the roll; every student whose name was called raised his/her hand)

G : "Well, I will remind you that you are already at grade XI. It is not the time for you to play a lot. Those who are a little bit naughty, please change your attitude. I am not only your math teacher in this class but also your homeroom teacher. Therefore I suggest you to behave and keep learning. I don't want to hear any more reports from other teachers concerning your bad behaviors during the lesson. Come on; show that this class has a good name in the school, having polite students and good achievement. Can you?"

SS : "Yes Sir."

G : "Well, are you ready to study now?"

SS : "Yes, Sir."

The form of classroom conditioning above occurred in the first meeting, the fifth meeting and the eighth meeting. The forms of classroom conditioning other than in the meetings mentioned above consisted of the condition in which the teacher asked the students' readiness to follow all of the teaching and learning activities and he continued to check the students' attendance without giving advice or motivation to students. After the teacher used classroom conditioning for the students to follow the teaching and learning activities, he gave apperception. The teacher did not give apperception in all of the meetings. Among the 10 observed meetings, he only used apperception in 3 meetings only, namely in meeting 1, meeting 4 and meeting 8. In the other meetings, the teacher directly delivered his material after he used classroom conditioning.

## 2. Main Learning Activities

The main learning activities refer to activities which aim to make the students understand the material which become the topic of the lesson. The teacher usually begins explaining the main materials and directing students to read their textbook containing the relevant explanation and examples of problems and how to solve them. The following is the example of teacher-students activities in initiating the discussion of the material. (The teacher stood in front of the class, opening student book and asking students to read student book) Today we will use our knowledge about minor and cofactor to determine the determinant value of matrix. Now, please read pages 8-10 of your book. I give you 3 minutes to read."

SG : (Reading the student book pages 8-10) The activity above is an example of activities found in meeting 2 for the topic of Matrix. In this main activity,

after the students finished reading the student book, the teacher usually gave an opportunity for the students to ask questions related to the material they had read or he directly gave explanation about the material that the students had read. Other activity found in the main learning activities included question and answer activity between teacher and students after the students read their books. In the main learning activities, the teacher not only gave an explanation concerning the examples in the student book, but also gave other examples that he created by himself so that the students found it easier to understand the material which became the topic of the lesson. After discussing the material existing in the student book and after giving examples other than those in the student book, the teacher gave exercises to the students. The exercises given by the teacher were sometimes made by the teacher himself and sometimes taken from the student book. The result of observation showed that in some meetings, namely meeting 7 and meeting 10, the teacher used discussion method to help students understand the material. When the discussion was in progress, the teacher went around, checking the students' participation in the discussion. The teacher guided them individually and in group, especially when the students had questions. When the teacher found that the problems had been answered or solved and the time given to students for discussion was over, he asked the representative of the group to come in front of the class to present the solution of the problem they had found.

## 3. Post-Learning Activities

In the post-learning activities, the teacher informed the students about the material which was going to be studied in the following meeting. Sometimes the teacher gave an assignment to students. In all meetings the teacher gave information to students about the next material in the next meeting, but he just gave assignments to students in 2 meetings, namely meeting 1 and meeting 3.

G: "If you do not have any question, I assign you to investigate whether the determinant features of matrix can also be applied in the addition and subtraction operations."

SB: "Yes, Sir."

## B. The Factors Underlying Student-Teacher Interaction at Grade XI of SMAN 5 Samarinda

The factors which underlay the occurrence of interaction between teacher and students during the learning process were identified from the results of observation and interview. There were 9 students who were interviewed after the teaching and learning process was finished.

The research findings which showed the factors underlying the students and teacher interaction in learning mathematics at grade XI of SMA Negeri 5 Samarinda can be presented as follows: 1) *Instructional Materials*

The result of interview to students showed that instructional materials became the factor which initiated

student-teacher interaction during the learning process. HN as the respondent stated that:  
 "...from the beginning I was interested in the materials and the way the teacher delivered the materials. It was not boring and I really read and pay attention."

The result of interview to the teacher also showed that interesting materials was the factor which triggered interaction between teacher and students in learning process. The teacher said that:

"The material (matrix) which is in the form of pattern, like the yesterday's material, is quite easy, but if it comes to reasoning stage, it will be difficult. If the forms are patterned, the students are able to solve them by observing and then questioning...."

## 2) Teacher and Students

The results of observation from the 10 meetings revealed the activities of the teacher during the learning process. They are outlined as follows:

- a. Teacher delivered the material which became the sub topic of the lesson.
- b. Teacher gave apperception and sometimes discusses the homework given in the previous meeting.
- c. Teacher asked students to read the student book related to the material which became the sub topic of the lesson.
- d. Teacher discussed the sub topic that had been read by the students.
- e. Teacher gave an explanation related to the examples of problems contained in the sub topic.
- f. Teacher gave exercises to students
- g. Teacher guided the students to make a conclusion about the material related to the sub topic.
- h. Teacher informed students about the next sub topic that was going to studied in the following meeting and sometimes the teacher gave an assignment to the students.

In terms of student factor, then following are the statements of some students related to this aspect:

"I rarely repeat (the math lesson) at home because I am busy with other subjects."

The students rarely repeated math lesson at home because they focused more on other subjects. From the 9 students interviewed, 5 students answered that they repeated math lesson at home only when they had homework to do. Two students said that they rarely repeated (math lesson) and 2 student answered that they repeated (math lesson). The reasons of students who answered that they repeated math lesson only when they had homework was expressed by HN as follows:  
 "Because there a lot of homework, Sir. Some other subjects also provide us with homework so that I find it so hard and I am confused of which one I should finish first."

## 3) Methods

During the learning process in the classroom, the teacher integrated some different methods; among other were question and answer, lecturing and discussion.

## 4) Learning Resources

During the learning process of mathematics, teacher and students used textbook as the learning resource. In every meeting, the explanation of sub topic was always preceded by reading the example of various problems existing in the student book.

## 5) Situation

The result of interview with a student named HN in relation to the condition of the classroom as the place for teaching and learning activities can be seen in following extract:

"I do not feel comfortable, Sir. The weather is hot, especially when we have math class on Thursday afternoon; the condition of the classroom is very hot..."

Relating to the above statement, the teacher gave a response as follows:

"Yes, it is right. The ACs in some classrooms are not in order. Therefore, the alternative way is by using fans, but the existing fans may not be able to cover all of the parts of the room, so that some of them feel uncomfortable (hot). In addition, the classroom also has a large number of students."

## 6) Tools and Instruments

Non-material tools used by the teacher in the teaching and learning process were advice, instructions and directions. While the material which help the teacher in the teaching and learning process consisted of textbook, board and board marker.

## 7) Evaluation

# IV. DISCUSSION

Thus research was conducted at SMA Negeri Samarinda in Academic Year 2017/208 with the total subject of 36 students of grade XI. This research aimed to obtain a description on the student-teacher interaction during the teaching and learning process of mathematics in the material of Matrix, flower, growth and decay at Grade XI of SMA Negeri 5 Samarinda..

One of the characteristics of learning is that all learning components are interrelated. Sumiati and Asra (2009: 3) classify the learning components into three main categories, teacher, learning content or materials, and students. Those components have considerable effects on the interaction process occurring when the teaching and learning are taking place.

Teacher is the learning component that gives a significant influence on a good educative interaction during the learning process. The result of observation during the learning activities at grade XI of SMA Negeri 5 Samarinda showed that the math teacher was able to give a positive influence on the good educative interaction process. He had a good personality. It was proven when he entered the class which was very noisy



and he was able to make it quiet before he started to use classroom conditioning to begin the lesson. The way he spoke or communicated to students was good. He did not look nervous and he spoke fairly, not too fast and not too slow. He used a language which was easy to understand and apply. He had a good mastery of the material so that the communication between teacher and students when discussing the material ran smoothly. He gave an explanation in both spoken and written forms.

Other component which also affects the interactional process in learning process is the content or instructional material. In this study, the learning material was the topics or the chapters of Matrix, Flower, Growth and Decay. The topic of Matrix is a chapter that had been introduced at grade X, so that the students had some overview related to the material. This might make the teacher and students easier to communicate it. The topic of Flower, Growth and Decay were new for the students but these materials were related to arithmetic sequences and series and geometric sequences and series which had been studied at grade XI so that these materials were not so complicated for the students to study them.

The next component which also affects the realization of educative interaction between teacher and students during the teaching and learning process is the students themselves. The students with high intelligence tend to be active in the learning activities. Selfmotivation and willingness of the students are required in order to keep learning. Based on the results of interview with some students, it was found that students had some different characters. Some of them were reluctant to repeat their lesson and some others always provided their times to repeat their lesson at home. Some students did not have any effort or tended to ignore their assignments given by their teacher. Some other students made great and serious efforts to accomplish their assignments. If these students found difficulties, they tried to find references from the books other than textbooks provided by the school or they search the materials on the internet. When the teaching and learning process was taking place, the students who had different characters also performed differently in the interaction during the learning process in the classroom. The students with high intelligence or those who were willing to repeat their lesson at home or those who made other efforts to enhance their insights tended to be active in the class. They asked questions, had discussion with their peers and even helped them to understand the material discussed in the classroom. This indicated that the component of student is considered as giving effects on the educative interaction between students and teacher during the learning process.

Suharsimi Arikunto stated that teaching and learning interaction covers the activities of maintaining a quite classroom, preparing learning instruments, apperception on the previous lesson, discussing homework, formulating instructional objectives, taking notes, dictating, explaining in spoken and written forms,

demonstrating in group, class discussion, students' independent learning, assisting students to learn individually and in group, students asking questions, giving formative evaluation, explaining again a certain part of lesson, and giving assignments to students [4].

The forms of learning interaction specified by Suharsimi above were also found in this research. The research findings showed that there were some forms of interaction between teacher and students in learning mathematics at Grade XI of SMA Negeri 5 Samarinda in Academic Year 2017/2018 for the topic of Matrix. The interactions took the forms of giving advice or motivation to students, giving instructions to the students, having questions and answers between teacher and students, either initiated by the teacher or the students, giving explanation to the students, having group discussion, working with exercises and giving assignments to students and informing students about the next material in the next meeting at the end of the lesson.

It was found in this research that the types of interaction that can be categorized as one-way interaction were in the forms of giving advice or motivation to the students, giving instructions to the students, especially instructions to read their book, to discuss one problem, to do the exercises, to present the result of their group work, having questions and answers between the teacher and the students in the form of feedback, either initiated by the teacher or by the students, which was usually occurred in the apperception activity, giving explanation to the students related to the sub-topic of the lesson, giving exercises and assignments as well as informing students about the next lesson at the end of the learning activity.

Furthermore, the types of interaction that can be categorized as two-way communication included questions and answers between teacher and students which take the form of feedback, for example when the teacher invited the students to observe the example of how to solve a problem and then the teacher gave an opportunity to students to ask questions or to respond and after that the teacher responded to the answers of the students. Thus, two-way communication occurred between teacher and students.

The types of interaction which can be categorized as multi-way communication during the learning process occurred in the discussion activity. The teacher divided the students into several groups and then the teacher asked the students to discuss one problem in each group followed by presentation from each group and finally the teacher highlighted the result of the group presentation and guides students to make conclusion

The research findings also showed that the frequency of the interaction between teacher and students during the learning process, especially at Grade XI of SMA Negeri 5 Samarinda was different in each meeting. This was caused by some factors, both internal factors, namely from the students themselves and

external factor such as teacher, time allocation, material and so forth.

In the learning activities with the topic of Matrix, the interactions were dominated by the teacher. He began the lesson by question and answer. Then the teacher asked the students to read their book and then directed them to understand the material that they had read by having question and answer activity. The teacher gave an explanation on the board for the students to understand the material easily.

In the learning activity with the topic of Flower, Growth and Decay, the interaction occurred equally between the teacher and the students. In explaining the lesson, the teacher used discussion method. The teacher divided the students into several groups. Every group was given a different problem to solve. Then, each group was required to present the result of the group discussion. At the end of the learning activities, the teacher directed the students to make a conclusion related to the topic that had been discussed.

Based on the research findings and discussion, it can be concluded that there were different types of teacher-student interaction in learning mathematics at Grade XI of SMA Negeri 5 Samarinda. The interaction sometimes occurred in one way, two ways, and multi ways. One-way interactions were found in the pre-activity in which the teacher greeted the students, and sometimes the teacher gave advice and motivation to the students. Two-way interactions occurred in question and answer activity between the teacher and the students, both in the apperception activity in the beginning of the lesson and in the main activity, namely when the teacher and the students discussed the materials relevant to the sub topic of the lesson. Multi-way interactions occurred when the teacher asked the students to have a discussion to solve a problem and after that it was followed by group presentations. The factor which underlay the occurrence of interactions between teacher and students in learning mathematics at grade XI of SMA Negeri 5 Samarinda in Academic Year 2017/2018 are as follows: a) the maximal efforts of the teacher in utilizing the facilities which supported the realization of interactions in the learning process; b) Students' interest in math lesson; c) Students' intelligence; d) the perception that the subject was important; e) Classroom condition which did not support the number of students in the classroom; and F) the utilization of learning resources by the students.

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